

What is claimed is:

1. A decision feedback equalizer in a terrestrial digital broadcasting receiver, comprising:

5 a channel estimating means for estimating a channel of a symbol-based receiving signal based on the receiving signal and a training sequence;

a channel-matched filtering means for changing a channel property of the receiving signal by maximizing a signal-to-noise ratio (SNR) of the estimated channel;

10 an input signal storing means for storing a receiving symbol of which channel property is changed by the channel-matched filtering means;

a channel equalizing means for performing a decision feedback equalization by repeatedly filtering the receiving signal which passed through the channel-matched filtering means;

a trellis decoding means for detecting a symbol, which is decision data, based on trellis decoding algorithm with decreased complexity, whose trace back depth is 1, from channel equalized receiving symbols, and outputting the symbol in a decision directed mode;

20 a statistical data calculating means for calculating statistical error data used in a blind mode and outputting the statistical error data;

a training sequence storing means for storing the training sequence;

a switching means for selecting a mode among the training mode, the decision directed mode and the blind mode;

30 an error signal calculating means for calculating an error signal by comparing an output signal in the mode selected by the switching means to an output signal of the channel equalizing means; and

35 a tap coefficient updating means for updating a

tap coefficient to be provided to the channel-matched equalizing means based on the error signal, the output signal of the trellis decoding means and the output signal of the input signal storing means.

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2. The decision feedback equalizer as recited in claim 1, wherein the tap coefficient updating means includes:

a feed forward filter (FFF) tap coefficient updating means for updating a tap coefficient to be provided to a FFF of the channel equalizing means based on the output signal of the input signal storing means and the error signal; and

a feed back filter (FBF) tap coefficient updating means for updating a tap coefficient to be provided to a FBF of the channel equalizing means based on the error signal and the output signal of the trellis decoding means.

3. The decision feedback equalizer as recited in claim 1, wherein the channel estimating means estimates the channel of the symbol-based receiving signal based on the training sequence and the receiving signal for each L field or for a first field, wherein 1 field includes 313 segments and L is larger than 1, generates the channel-matched filtering means in order to maximize the SNR of the estimated channel and passes the receiving signal through the channel-matched filtering means, and thereby the channel property of the receiving signal becomes mild.

4. The decision feedback equalizer as recited in claim 1, wherein the trellis decoding means detects a symbol based on a modified viterbi algorithm whose TBD is 1 and having the decreased complexity in American Advanced Television Systems Committee (ATSC) 8-vestigial sideband (8-VSB) transmission system using twelve trellis encoders, which are TCM decoders, based on a trellis code

interleaver and thereby a decoding delay becomes 0.

5 5. The decision feedback equalizer as recited in claim 1, wherein a symbol detecting process of the trellis decoding includes:

 a) calculating an absolute distance pair including two absolute distances between symbol pairs in an input signal of a symbol detector and a trellis diagram;

10 b) selecting an absolute distance having a small value for each absolute distance pair among absolute distance pairs;

 c) calculating an accumulated absolute distance by adding a previous absolute distance to a current calculated absolute distance for each state in the trellis diagram in
15 a time index;

 d) deleting the accumulated absolute distances except the smallest accumulated distance for each state in the trellis diagram in the time index;

20 e) selecting a state in which the accumulated absolute distance is smallest among all states shown in the trellis diagram in the time index and obtaining an output signal of the symbol detector, which is the trellis decoding means, from a branch shown in the trellis diagram transited to the selected state; and

25 f) repeatedly performing the steps a) to e) for each symbol time index.

30 6. A decision feedback equalizing method in a terrestrial digital broadcasting receiver, comprising the steps of:

 a) estimating a channel of a symbol-based receiving signal based on a receiving signal and a training sequence;

 b) changing a channel property of the receiving signal in order to maximize a signal-to-noise ratio (SNR) of the
35 estimated channel by passing the receiving signal through

a channel-matched filter;

c) determining a parameter used for a decision feedback of the receiving symbol whose channel property is changed, and initializing a channel equalization parameter;

5 d) detecting a symbol from an output signal of an equalizer in a specific time index signal according to the determined parameter based on a trellis decoder whose trace back depth is 1 and having decreased complexity;

e) calculating statistical error data used in a blind
10 mode;

f) selecting one mode among a training mode, a decision mode and the blind mode;

g) calculating an error signal by comparing an output signal of the mode selected in the step f) to an output
15 signal of a channel equalizer, and updating a tap coefficient based on the error signal; and

h) performing a decision feedback equalization based on the updated tap coefficient.

20 7. The decision feedback equalizing method as recited in claim 6, wherein the channel estimator estimates the symbol-based receiving signal based on the training sequence and the receiving signal for each L field, or for a first field, wherein 1 field includes 313 segments and L
25 is larger than 1, generates the channel-matched filter in order to maximize the SNR of the estimated channel and passing the receiving signal through the channel-matched filter, and thereby the channel property of the receiving signal becomes mild.

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8. The decision feedback equalizing method as recited in claim 6, wherein the trellis decoder detects a symbol based on a modified viterbi algorithm with decreased complexity, whose TBD is 1, in American Advanced Television
35 Systems Committee (ATSC) 8- vestigial sideband (8-VSB)

transmission system using twelve trellis encoders, which are TCM decoders, based on a trellis code interleaver and thereby a decoding delay becomes 0.

5 9. The decision feedback equalizing method as recited in claim 8, wherein the channel estimator estimates the channel of the receiving signal based on the receiving signal and the training sequence, generates the channel-matched filter based on information of the estimated
10 channel, equalizes the receiving signal passed through the channel-matched filter by using the decision feedback equalizer having the viterbi decoder with decreased complexity, whose TBD is 1, and thereby the channel equalization is performed effectively under an inferior
15 environment such as in a room or in mobile.

10. A symbol detecting method for channel equalization in a terrestrial digital broadcasting receiver, the method comprising the steps of:

20 a) calculating an absolute distance pair including two absolute distances between symbol pairs in an input signal of a symbol detector and a trellis diagram;

 b) selecting an absolute distance having a small value for each absolute distance pair among absolute distance
25 pairs;

 c) calculating an accumulated absolute distance by adding a previous absolute distance to a current calculated absolute distance for each state in the trellis diagram in a time index;

30 d) deleting the accumulated absolute distances except the smallest accumulated distance for each state in the trellis diagram in the time index;

 e) selecting a state in which the accumulated absolute distance is smallest among all states shown in the trellis
35 diagram in the time index and obtaining an output

signal of the symbol detector, which is the trellis decoding means, from a branch shown in the trellis diagram transited to the selected state; and

f) repeatedly performing the steps a) to e) for each
5 symbol time index.